the fibres in the neighbourhood of the section, owing to the extension of the demarcation-current along the nerve.[1]

By this electrotonic extension we can explain—or for the most part explain—the so-called "weak currents" of the longitudinal section.[2] A stimulus applied to the nerve near the line of section, according to the law of polarisational increment, should have a greater effect than when applied to points more remote, and this experiment shows to be the case. Finally, an excitatory wave travelling along the nerve towards the cut end of it must, according to the same law, gradually diminish before it disappears entirely in the area of section itself.

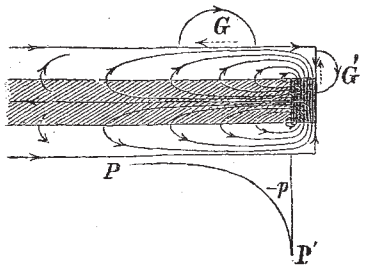

FIG. 8.

V. CONCLUDING REMARKS

The whole of the electrical phenomena of muscle and nerve, therefore, may be readily deduced from a few very simple propositions. Irritable protoplasm responds both to destructive and to exciting influences by an electromotive sign. The altered substance takes on a negative potential with respect to the unaltered. This, together with the doctrines of internal transverse polarisation and of the polarisational increment of excitation, appears fully competent to explain all the facts hitherto observed.

That these fundamental doctrines have the closest reference to the whole life of irritable tissues no one will be disposed to doubt. Yet much examination will be needed to disclose the exact nature of the interdependence.

Although it must now be confessed that the theories which were based upon facts discovered more than thirty years ago, have failed to withstand the criticism of a wider experience, the domain of animal electricity has not lost, but rather gained in interest. And the services of the man who not only discovered this region of physiology, but created the means of conquering it, and who made himself master of its most important fundamental features, are in no danger of becoming dimmed in our estimation by the theoretical changes we have been compelled to accept.

BAROMETRIC PRESSURE

IN a work of great importance,[3] recently published by Prof. Bert, on the physiological effects of barometrical pressure, the author sums up the conclusions to be drawn from his researches as follows:—

A. The diminution of barometric pressure acts on living beings only by diminishing the tension of the oxygen in the air which they breathe, in the blood which animates their tissues (*anoxytienne* of M. Jourdanet), and by thus exposing them to the dangers of asphyxia.

B. The increase of barometric pressure acts only by increasing the tension of the oxygen in the air and the blood. Up to about three atmospheres this increase of tension gives rise to intra-organic oxidations a little more active. Beyond five atmospheres the oxidations diminish in intensity, probably change in their nature, and, when the pressure rises sufficiently, are completely arrested. It follows that all living beings, aërial or aquatic, animal or vegetable, complex or mono-cellular—that all the anatomical elements, isolated (blood-globules, &c.) or grouped in tissues, perish more or less rapidly in air sufficiently compressed. This rule appears only to suffer exception for the reproductive corpuscles of some microscopic beings. For the higher animals death is preceded by tonic and clonic convulsions of extreme violence. Among vertebrates the rapid accidents due to the too great tension of oxygen only commence to manifest themselves at the moment when the hæmoglobin, being saturated with oxygen, that gas enters into the state of simple dissolution in contact with the tissues.

C. Diastases, poisons, and true virus resist the action of oxygen at high tension.

D. The inconvenient effects of diminution of pressure may be efficaciously combatted by the respiration of an air sufficiently rich in oxygen to maintain the tension of that gas at its normal value (20·9). Those of the increase of pressure may be combatted by employing air sufficiently poor in oxygen to arrive at the same result.

E. Generally the favourable or noxious gases (oxygen, carbonic acid, &c.) act only on living beings in accordance with the tension which they possess in the surrounding atmosphere, a tension which is measured by multiplying their centesimal proportion by the barometric pressure; the increase of one of the factors may be compensated by the diminution of the other.

F. When animals possess reservoirs of air either completely closed (swimming bladder of acanthopterygians, &c.) or in communication with the air during decompression alone (swimming vessel of the Cyprini, intestines of aërial vertebrates, &c.), or in communication with the air during both compression and decompression, but by very small orifices (lungs of aërial vertebrates, &c.), the diminution or increase of pressure may have physico-mechanical effects.

G. Sudden decompression from several atmospheres has only the effect (except for some cases comprised under conclusion F) of allowing to return to the free state the nitrogen which was, under favour of pressure, dissolved in the blood and the tissues.

H. The beings actually existing in a wild state on the surface of the globe are accommodated to the degree of oxygenated tension under which they live; all diminution, all increase, appears to be unfavourable to them when they are in a state of health. Therapeutics might make something out of these modifications in various patholgical conditions.

I. Barometric pressure and the proportion per cent. of oxygen have not always been the same on our globe. The tension of that gas has apparently been, and will without doubt continue to go on, diminishing. There is here a factor which we have not yet taken into account in biogenetic speculations. The power of reaction against these various modifications leads to the supposition that microscopic beings must have appeared first, and that they will be extinguished by the insufficient tension of oxygen.

K. It is inaccurate to teach, as is ordinarily done, that vegetables must have appeared in the earth before animals, in order to purify the air of the great quantity of CO_2 which it contained. In fact, germination, even that of mildew, does not take place in air sufficiently charged with CO_2 to be fatal to warm-blooded animals. It is quite as inaccurate, as I have observed long ago, to explain the anteriority of reptiles with warm-blooded animals by the impurity of the air tainted with too much CO_2; reptiles, in fact, are more injured by this gas than birds, and still more so than mammals.

SCIENTIFIC SERIALS

THE *Sitzungsberichte* of the Vienna Imperial Academy of Sciences (Natural History Section, vol. lxxvi. parts 1–5, and vol. lxxvii. parts 1–4) contain the following more important papers:—Addenda to our knowledge of annelids, by Dr. Aug. v. Mojsisovics.—On the orthoptera of the Senegal River, by Dr. H. Kraus.—On the fauna of the Cypris slates of the Eger tertiary strata, by O. Novák.—On the natural history of glimmer, by G. Tschermak.—Researches on cystolithes and some similar formations in the vegetable kingdom, by K. Richter.—On the genesis of salt deposits, particularly of those in western North America, by F. Posepny.—On the fresh-water fish of South-Eastern Brazil, by Dr. F. Steindachner.—On the "Salse di Sassuolo"

[1] "Arch. f. d. ges. Physiol.," vii., p. 363, 1873. This polarisation, of course, still occurs even when the demarcation-current is not abducted, or when the abducted portion is counterbalanced by an opposite current. In the latter case, according to Bosscha's law, the nerve behaves just as if no abducting circuit were applied to it. "Arch. f. d. ges. Physiol.," ix., p. 29, 1874; x., p. 237, 1875.

[2] In Fig. 8 the core of the nerve-fibre is obliquely shaded. Even in the absence of polarisation of the core the boundary current would become distributed after the manner shown in the figure, and would pass into the galvanometer circuits G and G' as the so-called weak longitudinal and transverse currents of du Bois-Reymond. But, with polarisation, the extension along the core is very much greater than without it, and at the same time the polarisational curve $p\,p'$ is produced.

[3] "La Pression Barométrique; Recherches de Physiologie Experimentale." Par Paul Bert, Professor à la Faculté des Sciences de Paris. (Paris: G. Masson. 1878.)

and the "Argille scagliose," by Theodor Fuchs.—On the flora of the countries round the Mediterranean and their dependence from the soils, by the same.—On the fossil flora of Parschlug, in Styria, by Dr. C. von Ettingshausen.—On the development of the embryo of *Asplenium shepherdi*, Spr., by F. Vouk.—On the internal cells in the antheridium cell of the pollen grain of certain coniferæ, by A. Tomaschek.—On the origin of aptychus-limestone, by Th. Fuchs.—On the light line in the prism cells of seed scales, by Dr. R. Junowics.—On the encircled specks in the wood of trees, by Dr. J. Kreuz.—On the firmness and elasticity of vegetable tissues and organs, by Th. Weinzierl.—On the resinous ducts of certain coniferæ, by Dr. Kreuz.—On the development of the pollen of *Colchicum autumnale*, L., by A. Tomaschek.—On some accessory appendages to the skull of Leporidæ, by Dr. A. von Mojsisovics.—On cork and cork tissues, by Dr. F. von Höhnel.—Histo-chemical researches on xyllophiline and coniferine, by the same.—On the phanerogamic flora of the Sandwich Islands, by Dr. H. W. Reichardt.—On the protoplasm of the pea, by Dr. Ed. Tangl.—On the undulating nutation of the internodes of the stems of plants, by J. Wiesner.—On the behaviour of Phloroglucine and of some similar substances towards the woody cell membrane, by the same.—On the degeneration in the leaf-shoots of some Amygdaleæ, caused by species of Exoascus, by E. Rathay.—Researches on Tunicata, by C. Heller.—On some new genera and species of Neuroptera, by Dr. F. Brauer.—On the originals to Ign. von Born's Testaceis Musei Cæsarei Vindobonensis, found in the Imperial Zoological Museum, by the same.—On the embryology of ferns, by H. Leitgeb.—Geological researches in the western part of the Balkan and the surrounding districts, by Franz Toula.—On some peculiar apertures in the corolla leaves of *Franciscea macrantha*, Pohl, by M. Waldner.—On the basaltic lava of the Eifel Mountains, by E. Hussak.—On the origin of holes and indentures in the leaf of *Philodendron pertusum*, Schott, by F. Schwarz.—Ichthyological researches, by Dr. F. Steindachner.—On the subterranean water-courses and basins, as well as on the clearness and transparency of certain lakes, and on the formation of lakes generally, by Dr. A. Boué.

Sitzungsberichte der physikalisch-medicinischen Societät zu Erlangen (part 10, November, 1877—August, 1878) contain the following more interesting papers:—On the fertilisation and division of the ovum of *toxopneustes*, by Dr. E. Selenka.—On the history of development of Jacobson's organ, by Dr. R. Fleischer.—On the theory of absorption and fluorescence, by E. Lommel.—On the physiological action of nitro-benzole and of aniline, by W. Filehne.—On the so-called soor-fungus and its identity with *Mycoderma vini*, by M. Reess.—On the changeability of the angles of crystals, by Dr. Fr. Pfaff.—On the theory of normal and abnormal dispersion, by E. Lommel.—Various mathematical papers, by M. Noether and Prof. E. Lüroth.—On the modification of sound phenomena in the human body, by F. Penzoldt.—On the theory of double refraction, by E. Lommel.—On the equations of the seventh degree, by F. Klein.—On some experiments made with *drosera*, by Drs. C. Kellerman and E. von Ramner.—On chelidonic and malic acids, by Dr. O. Liezenmayer.—Thermophysiological investigations, by J. Rosenthal.—On the derivates of cymol and of toluylic acid, by E. von Gerichten.—On the sexual organs of dibranchiate cephalopoda, by Dr. J. Brock.—On two new fluorescent substances, by E. Lommel.—On the influence of the changes in temperature and pressure upon the double refraction of light, by Dr. E. Pfaff.

Jahrbuch der k.k. geologischen Reichsanstalt (vol. xxviii. part 4, October—December, 1878) contains several highly interesting treatises, viz.:—On Alpine phosphates, by J. Gamper.—On the production of common salt from the Russian steppe lakes, by Dr. C. O. Cech.—Observations on the Jurassic formation in the Carpathian cliffs, by Victor Uhlig.—On the artesian well in the Stadtwäldchen near Budapest, by Wilhelm Zsigmondy.—On Emanuel Kaiser's views on the hercynian fauna, and the limit between the Silurian and Devonian formations, by Dr. E. Tietze.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Vol. xii. fasc. iii. We note the following papers in this number:—New phenomena observed in treatment of wine and must, with lime (continued), by Prof. Pollacci.—New physio-pathological researches on pulmonary phthisis (continued), by Prof. Giovanni.—Project of an electrical indicator of the level of water in a flood, by Prof. Ferrini.—Amplitude of oscillations of the declination-needle during 1877 and 1878, at the observatory of Brera, in Milan, communicated by S. Schiaparelli.—Determination of the difference of longitude between Milan Observatory and those of Padua, Monaco, and Vienna, by Prof. Celoria.

Fasc. iv.—First lines of introduction to the study of Italian bacteria (continued), by S. Trevisan.—Composition of butters in Lombardy, and analysis of butter in general, by Dr. Menozzi.—New researches on the rot of vines, by Prof. Garovaglio.—Researches on polar systems, by Prof. Jung.—On provision against trichina, by Prof. Bizzozero.

Fasc. v.—A new process of microscopic art, by Prof. Golgi.—Fruitful copulation of a dog with a cat, by Prof. Lemoigne.—On the intestinal anguillula, by Prof. Cantoni.

Atti della R. Accademia dei Lincei, February, 1879.—Necrological memoir of Gastaldi, by S. Sella.—On the expression of one of the limits in the correction of the elliptical co-ordinates in the theory of planetary perturbations, by S. De Gasparis.—On the composition of rocks of the mines of Montecortini, by S. Cossa.

Rivista Scientifico-Industriale, Nos. 4 and 5, 1879.—We note in these numbers a memoir by Prof. Perotti, on governing combination of the elements of gaseous mixtures.

No. 6.—On a baricentric property of the triangle, by Prof. E. Cavalli.—On a new experiment on electrolysis with weak electromotors, by Prof. A. Bartoli.—On the telephone and microphone as musical instruments, by G. Mocenigo.—Description of some new plants recently introduced into horticulture, by E. O. Fenzi. There plants are *Gentiana algida*, *Primula capitata*, and *P. stuartii*, *Nicotiana acutifolia* and *N. suaveolens*, *Eremurus robustus*.—On two new species of Myriapoda, *Polydesmus siculus* and *Atractosoma nigrum*, by Prof. F. Fanzago.—On a new reagent for cobalt, by Mr. Tattersall.—On poisonous colours, by the editor.

Archives des Sciences physiques et naturelles, March.—From this part we notice the following papers of interest:—On the influence of coloured light upon the development and growth of animals, by Emile Yung.—On the effects of induction coils upon the nervous system, by M. Schiff.—On an acceleration of the process of tanning by means of phosphoric acid, by E. Ador.—On methyl-aniline and toluidine and the colouring-matters derived from these compounds, by MM. Reverdin, Monnet, and Nölting.—On alizarine blue, by M. Graebe.—The other papers contained in the part have been noticed by us elsewhere.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, April 10.—C. W. Merrifield, F.R.S., president, in the chair.—Mr. Donald McAlister was elected a Member, and Messrs. A. J. C. Allen and E. Anthony were proposed for election.—The following communications were made:—Notes on quantics of alternate numbers, used as a means for determining the invariants and covariants of quantics in general, by the late Prof. Clifford, F.R.S. (communicated by Dr. Spottiswoode, P.R.S.).—Note on geometrical maxima and minima, Mr. J. Hammond.—On a class of fractions, Mr. R. Tucker.

Linnean Society, April 3.—William Carruthers, F.R.S., vice-president, in the chair.—Mr. W. T. Thiselton Dyer exhibited the inflorescence of *Gynerium saccharoides*, grown at Kew, but which had died during the winter severe weather. Excepting through Mr. Spruce's researches on the Amazons, little is known respecting this handsome plant, which differs from the Pampas grass in habit, and is tropical like maize, &c.—Dr. H. Trimen, in dealing with the subject of the myrrhs of commerce and pharmacy, showed the unique *Balsamodendron myrrha*, Nees. It was gathered by Hildebrandt in Somali Land, 1873, and possesses but few leaves and a single fruit; the traveller, however, saw the myrrh exuding from the tree itself. The original type specimens of *B. myrrha*, collected by Prof. Ehrenberg in Arabia, were also exhibited, and, according to Dr. Trimen, Hildebrandt's late statement of their identity with the foregoing seems well founded. Ehrenberg's other myrrh plant, the *B. Ehrenbergianum*, Berg., with his notes attached, and the *B. Playfairii*, Hook. fil., from Somali Land, with its gum called "Hotai," and other examples of varieties of myrrh and bdellium were placed before the Society and commented on by Dr. Trimen. He specially adverted to the liberality of the authorities